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Warrendale, PA 15086 -7573

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14. ABSTRACT
The International Symposium on the Growth of III-Nitrides (ISGN) series of conferences have been premier international forums for experts from academia, industry, and national laboratories to present their latest progress and exchange ideas in the fundamental and applied aspects of III-N bulk and epitaxial growth technologies as well as related device advances. III-N compound semiconductor materials underlie many of today's most advanced high-performance devices such as LEDs, laser diodes, and transistors, which are becoming an essential part of the solution of many global problems. In the future, III-N solar cells, nanostructure materials, and other innovative

15. SUBJECT TERMS
Growth of III-Nitrides, epitaxial growth techniques, ternary and quaternary alloys

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a. REPORT	b. ABSTRACT	c. THIS PAGE			Russell Dupuis
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Report Title

Final Report: International Symposium on the Growth of III-Nitrides (ISGN), May 18-22, 2014, Atlanta GA

ABSTRACT

The International Symposium on the Growth of III-Nitrides (ISGN) series of conferences have been premier international forums for experts from academia, industry, and national laboratories to present their latest progress and exchange ideas in the fundamental and applied aspects of III-N bulk and epitaxial growth technologies as well as related device advances. III-N compound semiconductor materials underlie many of today's most advanced high-performance devices such as LEDs, laser diodes, and transistors, which are becoming an essential part of the solution of many global problems. In the future, III-N solar cells, nanostructure materials, and other innovative devices will play a similar significant role in improving the human condition.

Enter List of papers submitted or published that acknowledge ARO support from the start of the project to the date of this printing. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in peer-reviewed journals:

(b) Papers published in non-peer-reviewed journals (N/A for none)

Received Paper

TOTAL:

Number of Papers published in non peer-reviewed journals:

(c) Presentations

Manuscripts are to be published in the following journal: Physica Status Solidi (c)(Wiley Publishing)~May 2015

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Received Paper

TOTAL:

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts):

(d) Manuscripts

Received Paper

TOTAL:

Number of Manuscripts:

Books

Received Book

TOTAL:

Received Book Chapter

TOTAL:

Patents Submitted

Patents Awarded

Awards

NONE

Graduate Students

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Names of Post Doctorates

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Names of Faculty Supported

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period: 0.00
The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:..... 0.00
The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:..... 0.00
Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):..... 0.00
Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:..... 0.00
The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense 0.00
The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields: 0.00

Names of Personnel receiving masters degrees

NAME

Total Number:

Names of personnel receiving PHDs

NAME

Total Number:

Names of other research staff

NAME	PERCENT_SUPPORTED

FTE Equivalent:
Total Number:

Sub Contractors (DD882)

Inventions (DD882)

Scientific Progress

Please refer to attachment.

Technology Transfer

None

ISGN-5 Symposium Chairs:
Russell D. Dupuis, Georgia Institute of Technology
Fernando Ponce, Arizona State University

ISGN-5 Objectives and Scope

The International Symposium on the Growth of III-Nitrides (ISGN) series of conferences have been premier international forums for experts from academia, industry, and national laboratories to present their latest progress and exchange ideas in the fundamental and applied aspects of III-N bulk and epitaxial growth technologies as well as related device advances. III-N compound semiconductor materials underlie many of today's most advanced high-performance devices such as LEDs, laser diodes, and transistors, which are becoming an essential part of the solution of many global problems. In the future, III-N solar cells, nanostructure materials, and other innovative devices will play a similar significant role in improving the human condition. ISGN-5 was organized to foster the continued advance of this important field of research and development. We actively solicited papers describing the latest work in the technical areas shown below.

ISGN-5 Symposium topics

- III-N Bulk growth: AlN, GaN, InN
- Epitaxial growth techniques
- Ternary and quaternary alloys
- III-N nanostructures
- Defect control and surface effects
- Optical and electrical properties
- III-N magnetic and spin-related phenomena
- III-N devices: FETs, HBTs, rectifiers, LEDs, lasers, photodetectors, and novel devices.

ISGN-5 Organizers and International Advisory Committee

The ISGN-5 was organized by a team of US-based experts in the field and the choice of Plenary and Invited speakers was based upon inputs from the International Advisory Committee composed of active III-N researchers from all over the world as shown below in the table.

ISGN-5 2014 Conference Committees			
1	Russell Dupuis	ISGN-5 Conference Chair	Georgia Institute of Technology
2	Fernando Ponce	ISGN-5 Conference Co-Chair	Arizona State University
3	Isamu Akasaki	Honorary Chair	Meijo University
4	Andy Allerman	Program Co-Chair	Sandia
5	Asif Khan	Program Co-Chair	Univ. South Carolina
6	Raj Bhat	Program Co-Chair	Corning
7	Mike Manfra	Publications Co-Chair	Purdue University
8	Christian Wetzel	Publications Co-Chair	Rensselaer Polytechnic Institute
9	Jae Hyun Ryou	Publications Co-Chair	Univ. of Houston
10	Alan Doolittle	Finance/Advertising Chair	Georgia Institute of Technology

ISGN-5 INTERNATIONAL ADVISORY COMMITTE			
1	F. Semond	(CRHEA, France)	France
2	M. Heuken	(AIXTRON, Germany)	Germany
3	G. Bruno	(Bari Univ., Italy)	Italy
4	H. Amano	(Nagoya Univ., Japan)	Japan
5	H. Asahi	(Osaka Univ., Japan)	Japan
6	K. Hiramatsu	(Mie Univ., Japan)	Japan
7	K. Kishino	(Sophia Univ., Japan)	Japan
8	A. Koukitu	(Univ. Tokyo, Japan)	Japan
9	H. Miyake	(Mie Univ., Japan)	Japan
10	Y. Nanishi	(Seoul National Univ., Korea)	Japan
11	T. Nishinaga	(Tokyo Univ., Japan)	Japan
12	A. Yoshikawa	(Chiba Univ., Japan)	Japan
13	S.-K. Min	(Kyung Hee Univ., Korea)	Korea
14	E. Yoon	(Seoul National Univ., Korea)	Korea
15	I. Grzegory	(Unipress, Poland)	Poland
16	D. Hommel	(Wrocławskie Centrum Badań, Poland)	Poland
17	S. Ivanov	(Ioffe Physico-Technical Inst., Russia)	Russia
18	B. Monemar	(Linköping Univ., Sweden)	Sweden
19	N. Grandjean	(EPFL, Switzerland)	Switzerland
20	J.-I. Chyi	(National Central Univ., Taiwan)	Taiwan
21	C. T. Foxon	(Nottingham Univ., UK)	United Kingdom
22	M. A. Khan	(Univ. South Carolina, USA)	USA
23	T. Kuech	(Univ. Wisconsin, USA)	USA
24	H. Morkoc	(Virginia Commonwealth Univ., USA)	USA
25	J. Speck	(UCSB, USA)	USA
26	F. Ponce	(ASU, USA)	USA
27	R. Dupuis	(Georgia Tech, USA)	USA

Activities and Findings

The ISGN-5 program had fourteen regular sessions and two poster sessions over four days. The total number of attendees was 146.

Registration Category	Registration Number
Registration - Pre-Reg Regular	80
Registration - Onsite Regular	20
Registration - Pre-Reg Student	36
Registration - Onsite Student	0
Registration - Pre-Reg Retired/Unemp	3
Registration - Onsite Retired/Unemp	3
Registration - Exhibitors	4
	146

The conference technical sessions began with a Plenary talk by André Strittmatter who described the current State-of-the-Art of GaN on Si. The regular sessions were begun with Invited Speakers as shown below. The full conference schedule is available here: http://www.mrs.org/isgn-5-program/

Plenary Speaker

André Strittmatter, Technische Universität Berlin, Germany

Invited Speakers

Martin Albrecht, Leibniz-Institut für Kristallzüchtung, Germany
Michał Bockowski, Institute of High Pressure Physics (UNIPRESS), Poland
April S. Brown, Duke University
Ramon Collazo, North Carolina State University
Mitsuru Funato, Kyoto University, Japan
Jung Han, Yale University
Carsten Hartmann, Leibniz-Institut für Kristallzüchtung, Germany
Holger Kalisch, RWTH Aachen University, Germany
Toru Kinoshita, Tokuyama Corporation, Japan
Yoshinao Kumagai, Tokyo University of Agriculture and Technology, Japan
Robert Leute, University of Ulm, Germany
Wsevolod Lundin, Ioffe Physical-Technical Institute, Russia
Yusuke Mori, Osaka University, Japan
Franck Natali, Victoria University of Wellington, New Zealand
Euijoon Yoon, Seoul National University, South Korea

ISGN-5 Sponsors and Exhibitors

ISGN-5 had significant financial support from the US Army Research Office and the National Science Foundation, and from the following exhibitors: AIXTRON, LayTec, American Elements, and Sandia National Laboratories.

We were fortunate to have the additional on-site support of 11 commercial vendors of equipment and services related to III-N materials and devices who arranged to have a booth at ISGN-5 to display and demonstrate their products. These companies are listed below.

AIXTRON SE
MOCVD/CVD/PECVD Equipment; OVPD and PVPD Equipment; ALD Equipment
Awww.aixtron.com

Aymont Technology Inc.
PVT; Crystal Growth; AIN; SiC; Gallium Oxide
www.aymont.com

Evans Analytical Group
Analytical Services
www.eag.com/mc

HexaTech, Inc.
Aluminum Nitride Wafers for UV-C LEDs; UV-C Lasers; High-Voltage Switches
www.hexatechinc.com

k-Space Associates, Inc.
In-situ Metrology Tools for Epitaxy
www.k-space.com

KITZ SCT America Corporation
Exhaust and Process Flow Valves and Fittings
www.kitz-sct.com/english/

Nitride Crystals, Inc.
Substrates for III-nitride Device Epitaxy
www.nitride-crystals.com

Proton OnSite
Hydrogen, Nitrogen and Purified Air Generators
www.protononsite.com

Riber, Inc.
MBE Systems; MBE Components
www.riber.com

Semiconductor Technology Research–STR Group
Software products: SimuLED, SimuLAMP, PVcell, CVDSim, Virtual Reactor
www.str-soft.com

Taiyo Nippon Sanso Corporation
MOCVD Systems; Industrial and Specialty Gases

www.mocvd.jp

Registration Fees

The ISGN-5 registration fees where: Regular-$850; Student-$650; Unemployed-$650.

Attendance and Program

The conference attendance was 146 registered individuals. The relatively low turnout was believed to be due to several competing US-based and international conferences which were being held in the summer and early Fall 2014 which probably caused some potential attendees to make other plans for presenting their work. Most attendees were from the USA with a large number from Germany, Japan, and the UK. There were 133 abstracts submitted covering the conference topics. The accepted papers were arranged in fourteen oral sessions, with two poster sessions.

Training and Development Provided

This symposium provided an opportunity for training and development in several ways. First, it provided a venue for the students to give their presentations to a wide audience with many experienced specialist in attendance which provided a very useful interaction in the question sessions and beyond at coffee breaks and in the evenings. Secondly, it allowed the GRAs to interact among themselves and compare experiences and research ideas. Thirdly, it provided an opportunity for the GRAs to see State-of-the-Art equipment and services related to this field which is difficult to experience any other way than by attendance at a conference. Finally, it will give them an opportunity for the publication of their results in a well-recognized refereed journal, Physica Status Solidi (c). The list of GRAs and their institutions is shown below.

Support for Student and Post-Doctoral Presenters

ISGN-5 had thirty Graduate Students who gave oral or poster presentations. The list of these attendees and their institutions is shown below. The funds we obtained for student support from the US government were distributed among the US-based students. This totaled eighteen students so each student was reimbursed $416.66 to partially cover the cost of registration of at $650 each.

	PRESENTER	***University***	***Student***	***SESSION TYPE***
1	Benjamin Leung	Yale University	Yes	Oral
2	Chloe Fabien	Georgia Institute of Technology	Yes	Oral
3	Daniel Rosales	CNRS-L2C	Yes	Oral
4	Haoning Li	Tyndall National Institute	Yes	Oral
5	Isaac Bryan	North Carolina State University	Yes	Oral
6	Jeomoh Kim	Georgia Institute of Technology	Yes	Oral
7	Jingzhou Wang	Ohio University	Yes	Oral
8	Manish Mathew	University of Tokyo	Yes	Oral
9	Mark Beeler	CEA Grenoble	Yes	Oral
10	Mohan Nagaboopathy	Indian Institute of Science	Yes	Oral
11	Payman Karvani	Rensselaer Polytechnic Institute	Yes	Oral

12	Pramod Reddy	North Carolina State University	Yes	Oral
13	Priti Gupta	TIFR	Yes	Oral
14	Shun Washiyama	North Carolina State University	Yes	Oral
15	Tsung-Ting Kao	Georgia Institute of Technology	Yes	Oral
16	Wei Guo	North Carolina State University	Yes	Oral
17	Xiao-Hang Li	Georgia Institute of Technology	Yes	Oral
18	Yoshinobu Watanabe	Mie University	Yes	Oral
19	Zachary Bryan	North Carolina State University	Yes	Oral
20	Zakaria Al Balushi	Pennsylvania State University	Yes	Oral
21	Brendan Gunning	Georgia Institute of Technology	Yes	Poster
22	Byung Oh Jung	Nagoya University	Yes	Poster
23	Daniel Seidlitz	TU Berlin	Yes	Poster
24	Jakub Niescior	Warsaw University of Technology	Yes	Poster
25	Milena Bobea	North Carolina State University	Yes	Poster
26	Rasanga Samaraweera	Georgia State University	Yes	Poster
27	Remi Comyn	CNRS	Yes	Poster
28	Sampath Gamage	Georgia State University	Yes	Poster
29	Ustun Sunay	University of Alabama-Birmingham	Yes	Poster
30	Yuto Watanabe	is wiputomys@mist.ocn.ne.jp	Yes	Poster

The funds provided by ARO were used to support the USA-based graduate students who gave oral or poster papers at this conference.